AeroAstro™

Making Space for Everyone℠

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SPORT™

VEHICLE

Small Payload Orbit Transfer

Flight of Opportunity

What is SPORT?

Arianespace

Ariane 5
Heavy Launcher

SPORT™
VEHICLE

Small Payload Orbit Transfer

SPORT Is a Flexible, Low-Cost, Orbit Transfer Vehicle Ideally Suited to Deliver a Wide Range of Spacecraft Into a Variety of Orbits Using Shared Ride Launch Opportunities

Microsatellite Going to GTO (No SPORT)

Microsatellite Going to Custom Orbit

SPORT

First SPORT Launch Late '03 to Early '04

Development Partner and Initial Customer for SPORT™

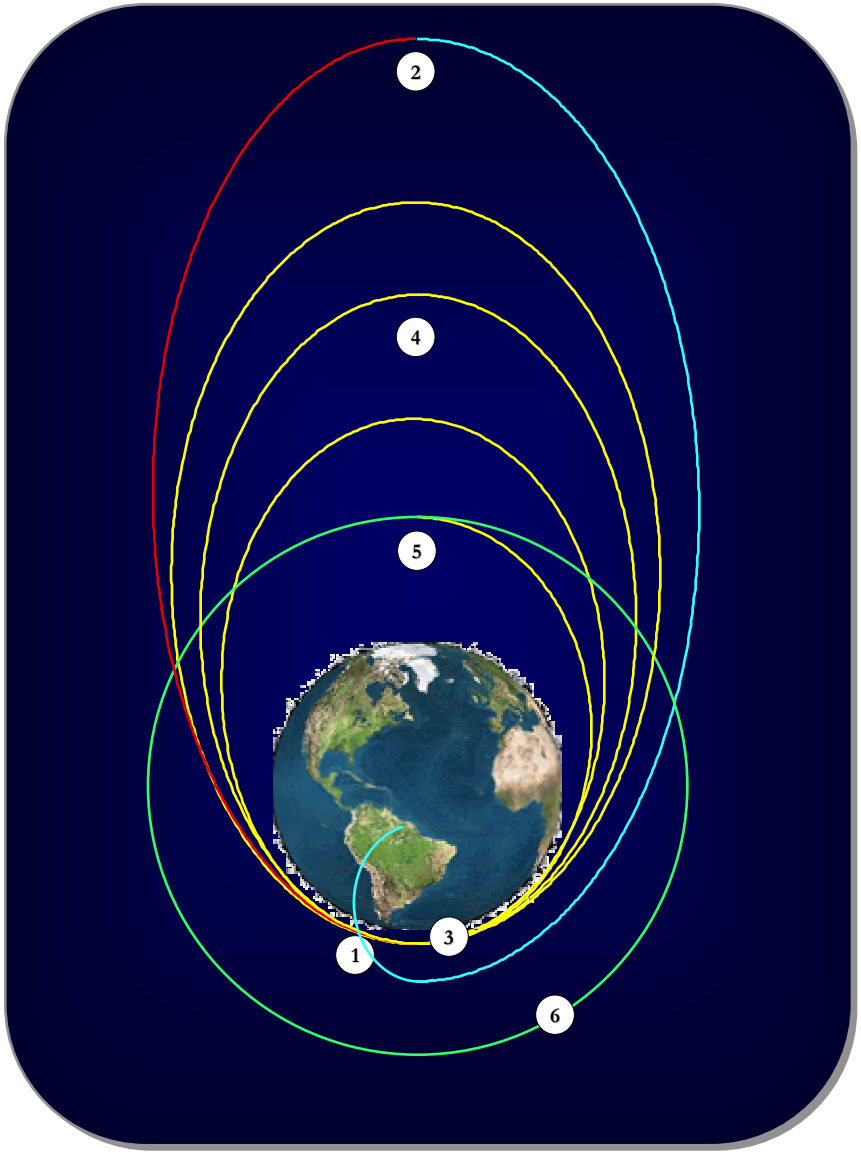
ASTRONAUTIC TECHNOLOGY

Malaysian National Space Company

- Malaysia Investing in SPORT to Obtain a Low-Cost Means of Launching a Constellation of Equatorial Remote Sensing Satellites
- First Mission (V-1) is a Technology Demonstration Mission
  - Proves the Aerobraking Technology and System Concept
  - Reduces Risk and Retires NRE for Future Launches
  - Flight-of-Opportunity for Payloads Willing to Take Some Risk

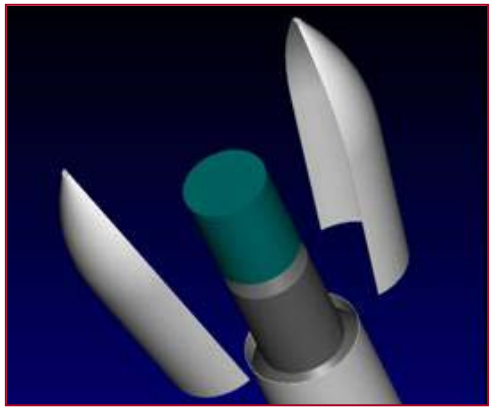
U.S. Patent #6,286,787, Issued 11 Sep 2001 "Small Satellite Orbit Transfer Vehicle"

GTO to LEO Mission Profile Example

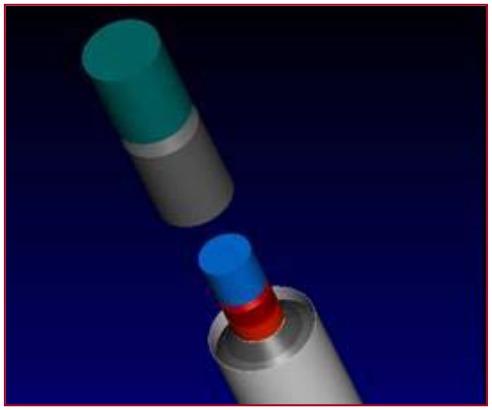


1. Launch to GTO Aboard Ariane 5
   - Systems Checkout and Aerobrake Deployment
2. Perigee Lowering Burn
   - Lowered in Stages to Aerobraking Altitude
3. Aerobraking Drag Near Perigee
   - Atmospheric Drag Reduces Orbit Energy
4. Apogee Burns to Control Perigee
   - Counter Secular Orbit Errors
   - Control Rate of Descent
5. Perigee Raising Burn
   - End Aerobraking at Desired Apogee
   - Raise Perigee in Stages to Final Altitude
6. Final Circular Orbit
   - Trim Maneuvers As Necessary
   - Despin & Payload Release
   - Burn to Depletion to Deorbit SPORT

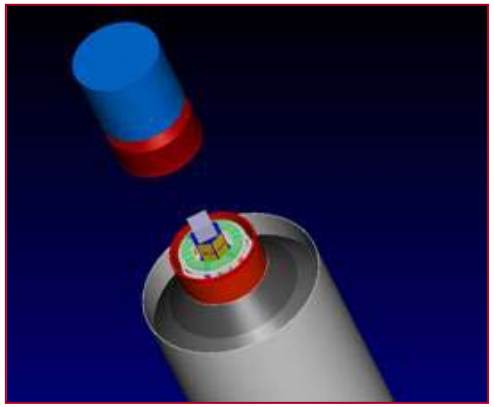
SPORT-Ariane Separation Sequence



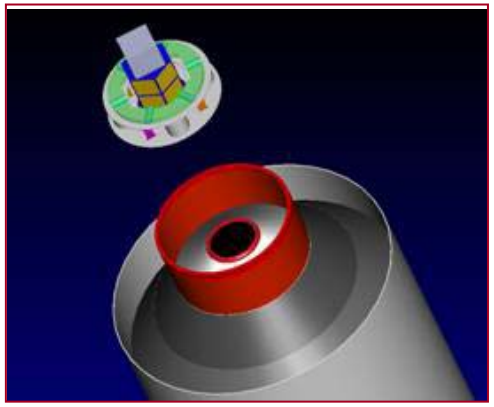
Ariane Fairing Separation



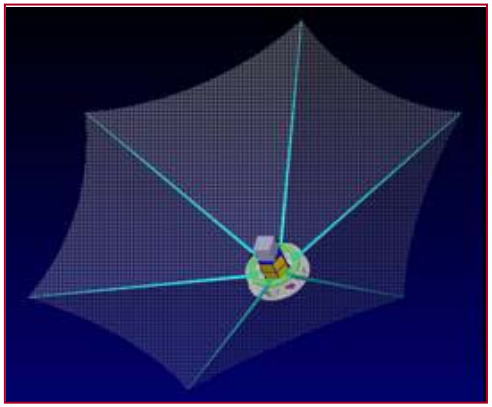
Primary Payload Separation



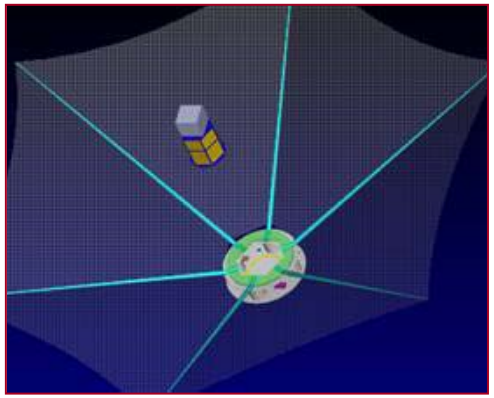
Secondary Payload Separation



Ariane-SPORT Separation



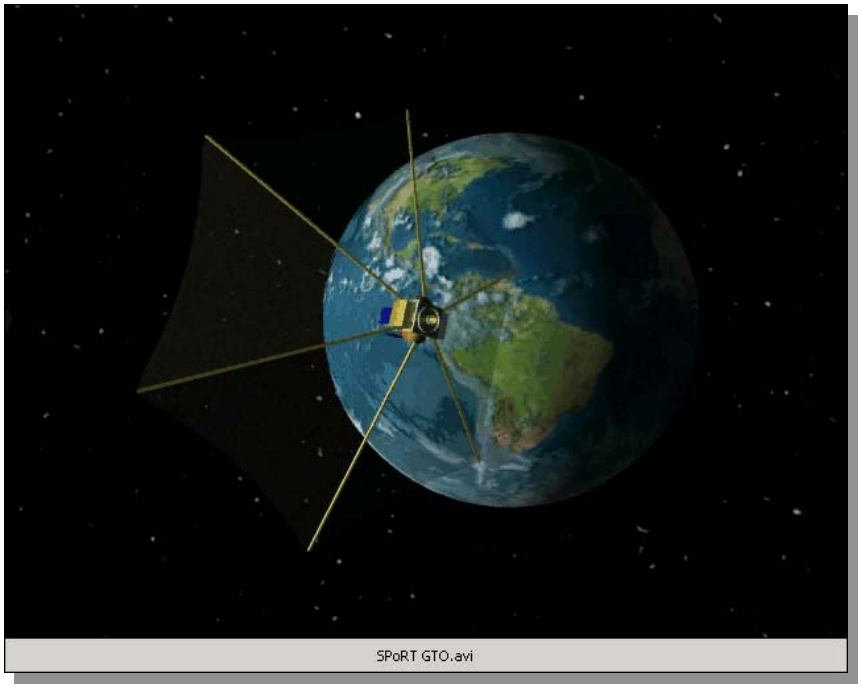
SPORT While Aerobraking



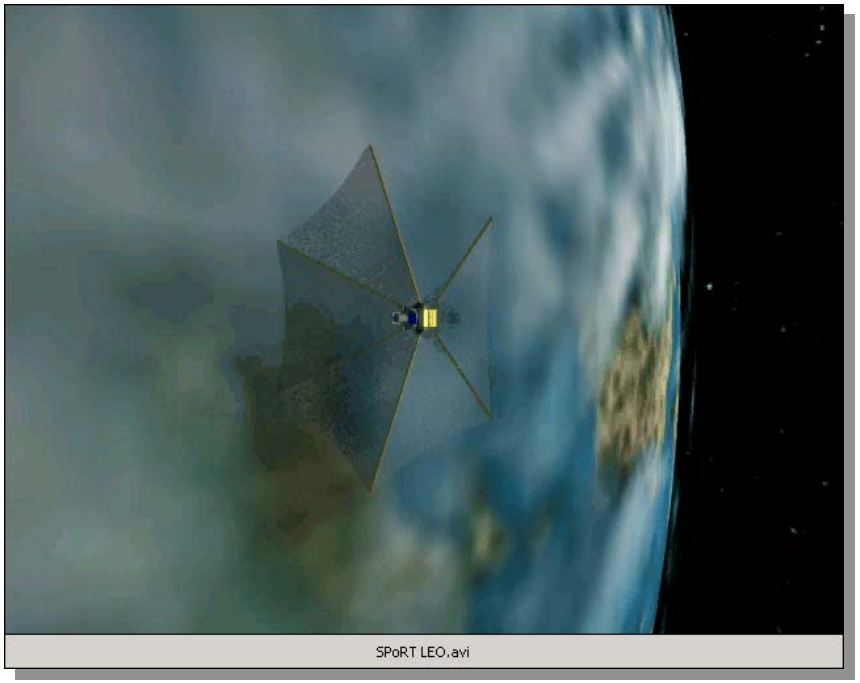
Separation of SPORT's Payload

SPORT Mission Simulations

SPORT in GTO Transfer

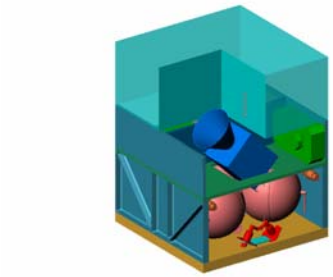
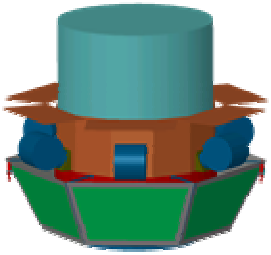


SPORT at LEO Termination



Resources Provided By SPORT

Two Vehicle Configurations Remain Under Consideration for the First Mission

	Micro SPORT	Mini SPORT
		
Payload Volume Available	25 cm H x 54 cm L x 54 cm W (With small intrusion by the star tracker)	110 cm H x 120 cm ∅
Payload Mass Available	23 kg	200 kg
Payload Power Available	50-100 W (while illuminated)	100 W (while illuminated)

SPORT Versions & Capability

Micro SPORT

- Launch Specifications
  - Mass: <120 Kg
  - Envelope: 60 X 60 X 71 cm
- Nominal Payload Capability
  - Mass: 23 Kg
  - Altitude: <500 Km
  - Inclination: LV Inclination
  - Envelope: 25 H x 54 L x 54 cm W
- Mechanical Interface
  - 298 mm (11.73 In) Diameter I/F Ring
- Electrical Interface
  - 2 Unregulated Power Lines
    - Total 3A @28 V +/- 6V
  - 50-100 W Orbit Average Power
  - 1 Bi-directional Serial RS-485 Line
  - 5 0-5V Analog Lines
- Memory 2MB Payload Storage
  - Data Rate Payload-to-SPORT 128-256 Kbps
- Payload Separation
  - < 1.0 Deg/Sec/Axis Tip-off Rate

Mini SPORT

- Launch Specifications
  - Mass: 600 Kg
  - Envelope, 2.0m ∅; 1.5m H
- Nominal Payload Capability
  - Mass: 200 Kg
  - Altitude: 400-1000 Km
  - Inclination: Limited ΔI Capability
  - Envelope: 110 cm H; 120 cm ∅
- Mechanical Interface
- 965 mm (38 In) Diameter I/F Ring
- Electrical Interface
  - 2 Unregulated Power Lines
    - Total 3A @28 V+/- 6V
  - 100W Orbit Average Power
  - 1 Bi-directional Serial RS-485 Line
  - 5 0-5V Analog Lines
- Memory 2MB Payload Storage
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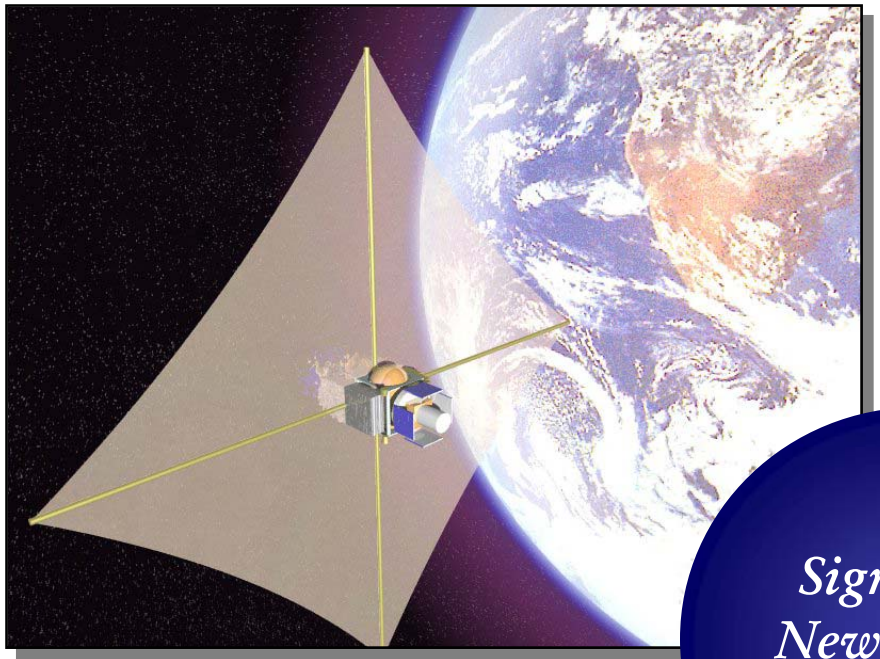
Conclusion



New Means To Orbit For Micro & Nano Spacecraft

Launch Price Similar To Spacecraft Price

Innovative, Flexible, Affordable

Significant New Launch Opportunities